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DOMINION BUREAU OF STATISTICS
CENSUS DIVISION

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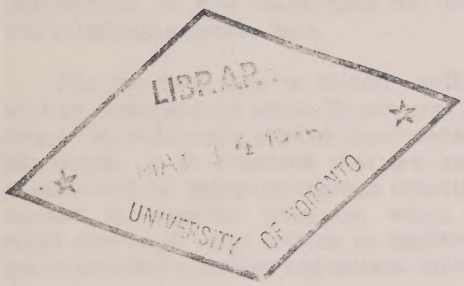

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THE 1971 CENSUS – AN OVERVIEW

W.D. Porter*

Tuesday, June 1, 1971 will mark the hundredth anniversary of census-taking in this country since Canada became a nation. Appropriately, the passing of this important milestone will be marked by the introduction of new techniques for both gathering and processing census data.

For the first time in history, self-enumeration will be employed for about 97 per cent of the population. By delivering printed questionnaires to each household, it is expected that the quality of the results will be improved through reduction in errors caused by response variance, which represents a major source of error arising in traditional canvasser-respondent question and answer interviews.

Population and housing questionnaires can be answered for the most part by blacking in small circles with a pencil. The completed questionnaires (after initial checking and coding operations) will be photographed on microfilm by high-speed automatic cameras and the data transferred directly to computer tape by an ingenious machine called FOSDIC (Film Optical Sensing Device for Input to Computers).

The new collection and processing techniques, coupled with much more intensive use of sampling, are expected to produce more statistical data of a higher quality than ever before, with accompanying improvements in the timeliness of publication.

The new techniques were described briefly by the Hon. Jean-Luc Pepin, Minister of Industry, Trade and Commerce, in an announcement issued in Ottawa last September 22. News media in general reacted favourably to these aspects of the forthcoming census. Such reactions, following the successful results of extensive field tests, indicate reasonable grounds for the belief that the procedures will be readily accepted by householders. It is important that wide acceptance of the methodology be attained, since the new "do-it-yourself" techniques require a greater degree of participation in the collection process on the part of the public than did the traditional canvasser methods.

Meeting Modern-day Needs

The increasingly complex problems of modern-day planning, administration and research, in both the public and private sectors, have led to a substantial escalation in the demand for information. Regional development planning, urban renewal projects, education and manpower programmes, poverty and welfare assistance measures, and market research analysis are some of the fields in which increasing needs of users have been articulated and evaluated during the planning stages for the 1971 Census.

The Census of Canada today has far wider uses and applications than its original purpose of apportioning electoral representation. Its importance hinges on its role as an inventory of the people – their numbers and local distribution, age and sex, language, ethnic and religious composition, educational attainment, occupational and industrial employment, income levels, housing and agricultural conditions.

These facts are not only vital in themselves but become especially significant when derived from a census which permits their analysis in relation to one another, and when viewed against the background of history and natural environment. Census data form a standard by which other indicators relating to the nation's well-being can be measured with real meaning (e.g. birth and death rates, criminality, production, trade, wealth, unemployment, migration). Of critical significance are the uses made of the census results in the development of plans and the formulation of social and economic policy by government departments and the business community.

The average Canadian householder, of course, can hardly be expected to appreciate the real value of his contribution to the vast store of significant information collected in a census. To most people, the intangible benefits arising from the process which develops information about a certain individual or family into aggregate statistical data which are then used as a basis for decisions involving millions of dollars are simply too remote to be appreciated. Nevertheless, the Canadian people have always shown a remarkable willingness to co-operate in the taking of decennial and quinquennial censuses.

The Historical Background

Canada has a rich and notable history in the field of census-taking. It dates back to 1666, when the world's first census in nearly a thousand years was taken in what is now Canada, but was then New France and Acadia.

Before that event took place, the process of census-taking had evolved over a long period, dating back almost to 4000 B.C. That is when, records indicate, the Sumerian city states in the area of ancient Babylon began to take inventories of people, property and livestock.

There are records of censuses of a kind in China about 3000 B.C. and in Egypt about 2200 B.C. The Egyptians influenced the Hebrews and the Old Testament carries several references to the head counts of the time. The Greeks and Romans also took censuses.

In those ancient days, the primary purpose of taking a census was to collect taxes. But governments of the day also found it a useful means of

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ear-marking young men eligible for conscription into their armies and identifying others available for forced labour.

It was not until the Roman Empire began its ascendency in the Mediterranean that the census became a systematic and methodical procedure. The Romans quickly became the most consistent and skilful practitioners of the art, making frequent and regular use of the census for hundreds of years.

Counting heads and tax resources as methodically as they built their highways, the emperors of Rome were able to develop military might to the point where their armies were invincible and their treasuries ample to support them.

But when the Empire finally collapsed about 600 A.D., the census fell into disuse and, ultimately, total oblivion, from which it was not rescued for another thousand years. In the whole period between 600 and 1600 A.D., only two instances of census-taking on any scale are recorded. And both were unique projects, never repeated.

One was the compilation of the Breviary of Charlemagne in 808 and the other, the famous Domesday Book prepared on William the Conqueror's orders in 1086.

The Encyclopedia Britannica credits what is now Canada as being the site of the first effort since Roman days to take a regular census in an area larger than a single city. Jean Talon, the Great Intendant, organized a census of New France (Quebec) in 1666 and, five years later, repeated the process in Acadia (Nova Scotia). (There were also censuses in 1667 and 1668 of New France.)

Talon's first census listed 3,215 persons, with details of age, sex, marital status and occupation. In 1667, additional questions were asked about livestock and property under cultivation. Thus was born the modern idea of a population census as a means of providing information about the structure of the society, rather than seeking to identify and control individuals. Fifteen censuses of New France and nine of Acadia were taken between 1666 and 1754. Questions were added with each new census, going into such matters as crops, livestock, buildings, churches, grist mills, sawmills, firearms and swords.

Britain's oldest colony, Newfoundland, took its first census in 1687, followed by five more in the next 24 years. Nova Scotia took its own censuses under its new name from 1762 to 1851.

Quebec continued to take a regular inventory of its human and economic resources throughout the 18th and 19th centuries, holding six censuses between 1753 and 1831. Ontario did not take its first census until 1824, but evidently set out to make up for lost time by repeating the process annually for 18 years.

Meanwhile, New Brunswick in 1824, Assiniboia (later to become Manitoba) in 1831, and Prince Edward Island, in 1841, joined the ranks of British colonies in North America to adopt the census as an instrument of government.

The first "Canadian Census Act" was passed in 1841, at the time of the Union of Upper and Lower Canada, providing for a census of Upper Canada "in 1841 and in every fifth year thereafter". Lower Canada was added to the census area by another piece of legislation in 1843.

In 1870, the district of Assiniboia became the province of Manitoba by joining Confederation. Earlier that year it conducted its last census but used its new name. British Columbia took its first census in 1871, a year before entering Confederation.

Arrangements could not be made to include the new provinces in the first national census of 1871, but they were part of the 1881 Census, as was Prince Edward Island, which acquired provincial status in 1873.

Alberta and Saskatchewan became the eighth and ninth provinces in 1905, created out of the vast sweep of land known as the Northwest Territories. Normally, they would not have been included in a census until 1911, but a change in federal government policy brought them into the statistical picture five years ahead of schedule.

The west was growing rapidly at the turn of the century, as a result of large-scale immigration (2.9 million immigrants between 1901 and 1914) and a steady tide of migration from the eastern provinces. In 1896, the government decided that a farm and population census of Manitoba might help to measure the changes that were taking place at such high speed.

In 1906, this census was broadened to include the two new Prairie Provinces. It was called a quinquennial census, because it fell five years after one decennial census and five years before the next.

For the next 40 years, the Prairie Census served a valuable purpose. The population picture in the western provinces was changing so rapidly that census information had to be updated twice as often as in the rest of the country.

By 1956, however, this was no longer true. The special need for Prairie censuses had disappeared. Growth rates had become stabilized and, indeed, the pendulum was swinging the other way.

But the value of updating population figures every five years had become apparent to all users of census information. In response to their pleading, the government extended the quinquennial census of 1956 to embrace the whole country. The process was repeated in 1966 and has now become a permanent element of the Canadian statistical system.

(Continued on page 114)

(Continued from page 5) **The 1971 Census – An Overview** – Continued

Content of Questionnaires

The number and nature of questions asked in the decennial census have changed over the years to meet changing needs for information. Starting several years before every census, planning committees meet with representatives of other federal departments and agencies and receive submissions from provincial statistical agencies and groups representing the business and agricultural communities, universities, town planning experts and other users of census data. Census questions are then developed to meet the most vital information needs.

For example, it was not until 1901 that residents born outside Canada were asked when they immigrated and their country of citizenship. This was a direct result of the rising tide of new arrivals during the last decade of the 19th century.

Questions are also dropped when they cease to have relevancy. The 1931 Census, accordingly, was the last in which people were asked whether they could read and write. The illiteracy rate was so low by then that the 1941 Census turned its attention to the number of years of schooling and other more meaningful educational data.

On the other hand, it was not until 1941 that the census began to concern itself in detail with information about housing, and every housing question on the 1971 Questionnaire was first asked in that year or later.

Decisions to include or exclude proposed questions in the 1971 Census were based on such factors as: (a) the value of the information a question judged to be in the national interest could be expected to produce; (b) relative costs; (c) the ease or difficulty of obtaining reliable data; and (d) respondent work loads and tolerance.

The evidence available from some three years investigation of user needs along with evaluations through field testing programmes indicates that the 1971 Questionnaire content represents a judicious balancing of the essential criteria: it will satisfy the needs of an increasing number of users without imposing an unacceptable burden on respondents.

Population and Housing. – Changes in the questions from the previous 1961 Censuses of Population and Housing that have been recommended for 1971 result mainly from demands for more detail within existing subject fields. Education questions have been expanded to include vocational and occupational courses; net income of persons operating farms has been added to round out the income picture; a question on language commonly spoken, recommended by the B and B Commission, has been added to those on mother tongue and official language; transportation agencies and town planners have effectively argued for inclusion of a question on address of place of work to determine relationships between where people work and where they live. Additional questions have been included on rent, fuel used, and vacation homes.

Agriculture. – The Census of Agriculture is taken at the same time as the Censuses of Population and Housing. Questionnaire planning for the 1971 Census of Agriculture began in 1967 with the formation of a federal interdepartmental committee. During early 1968, meetings were held with provincial representatives in each province, with university users, with the federal Department of Agriculture, and with the Statistical Committee of the Farm Equipment Institute. Recommendations were reviewed by the interdepartmental committee and the resulting questionnaire was field-tested in October 1968.

In the 1971 Census of Agriculture, one general questionnaire is planned to replace the four questionnaires used in 1961. Irrigation questions and questions on forest products (on a reduced basis) form part of the general questionnaire for 1971. New questions relate to the use of fertilizers and sprays, and to the classification of the part-time work of farm operators by kind of work done. Additional items of farm machinery and equipment are included in the appropriate questions.

The questionnaire on non-farm holdings is being dropped since their importance is now negligible. In summary, farm operators will have approximately the same number of agricultural questions to answer in 1971 as in the preceding decennial census.

General Methodology

The development of the proposed methodology for the 1971 Census received its initial impetus from the evaluation of the quality of the 1961 Census and from the study of similar international experience, particularly in the United States. This research identified several important sources of error to which census statistics are subject. Respondents may inadvertently or deliberately provide erroneous information. Canvassers may influence answers in a number of damaging ways. Additional errors are possible at the data processing stage. The studies indicated that by far the largest reduction in error could be expected if the role of the respondent in the data collection process was increased, by eliminating in so far as possible the traditional "quick interview" approach.

Development of "Self-enumeration" Techniques

From the foregoing studies, it became an objective of the 1971 testing programme to develop methods that would minimize the use of the canvasser interview technique. These methods, involving self-enumeration, have several variations, but a common goal is to have each adult member of every household answer the census questions pertaining to himself, and where necessary to consult relevant records. Households or persons who do not answer the census questions or who make significant omissions are contacted by telephone or canvassed by a Census Representative. Thus, the latter field employee has still a most important role to play in

assuring complete coverage, in checking completed questionnaires for accuracy and consistency, and in following up respondents to correct deficient records.

The "do-it-yourself" technique of enumeration is preferable to the traditional method where the canvasser must ask, interpret and record quick answers to intricate questions, given for all members of the household by any responsible member who happens to be found at home.

A small proportion of the population cannot, however, be covered by self-enumeration techniques. These include for example, the people in the vast northern regions, the coastal outports, institutions, and military barracks, all of which present special problems requiring traditional canvasser methods.

Field Testing Programme

To investigate the merits of various field methods for the 1971 Census, a series of census field tests were designed, starting with a small pre-test in Ottawa in December 1966, followed by a complete test enumeration of the city of London in September 1967, a test of 6,000 households in Toronto in June 1968, and a rural test in four representative localities across Canada in October 1968.

Two of the tests assessed the advantages of self-enumeration, with questionnaires mailed to all householders for their completion and returned by mail to a central processing office. In the rural test, a combination of the traditional interview method and enumerator "drop-off" and "pick-up" of questionnaires was employed.

Response rates in these various field tests indicated the feasibility of employing self-enumeration techniques. A Trial Census, or full-scale dress-rehearsal was held in September 1969 in three localities: Sherbrooke, Quebec, St. Catharines, Ontario and the rural areas around Souris, Manitoba. As a result of this intensive testing programme, field plans for the 1971 Census call for a system of "drop-off" of self-enumeration questionnaires by Census Representatives to the householders for their completion and "mail-back", to be employed in the larger urban centres. In smaller centres and rural areas, the Census Representatives will drop off the questionnaires (including agriculture, where applicable) but instead of the mail-back procedures, they will return to pick up the completed forms.

The Use of Sampling

The introduction of extensive sampling in 1971, combined with self-enumeration, appears to offer the best combination to achieve the basic aims of the census in terms of cost, quality, and timeliness of the data. The field methods have, as a main objective, the production of data of higher quality through the use of self-enumeration techniques. Sampling is an essential technique in reducing the burden on the respondent. There have been strong pressures to expand the range of inquiry of the census. Without sampling, the additional questions could not have been included in the 1971 Census, partly because of the response burden which would be imposed on the public.

Sampling has been used as a census-taking technique in Canada since 1941. At that time, its use was restricted to the collection of housing data and a sampling ratio of 10 per cent was employed. The procedure proved to be effective and was extended to a 20 per cent ratio in 1951 to provide additional geographical detail. In 1961, its use was further extended to a few population questions, and a sample of 20 per cent of households was asked additional questions about income, migration and fertility.

A major extension of this technique will be used in the 1971 Census. A great deal of intensive investigation of the relative costs and benefits of alternative sampling ratios for different combinations of questions preceded the final decision to recommend a 33 1/3 per cent sample for all but the basic questions. A "short" questionnaire, containing just 6 basic population questions, to be answered by everyone, and 9 housing questions to be answered by household heads, will be completed in two thirds of all households in Canada. A "long" questionnaire containing the same 15 basic questions, plus 20 housing, and some 50 socio-economic population items will be answered by the remaining one third of Canadian households. Thus, compared to the 1961 Census, two thirds of all households are being asked substantially fewer questions (averaging 9 per person as compared to 20 in 1961), and only one-third are asked significantly more questions (averaging 48 per person as compared to 36 in 1961). The more extensive use of sampling is not expected to reduce the availability of 1971 Census statistics as compared to 1961, for either small geographic areas or detailed cross-classifications.

The degree to which sampling is employed is directly related to the reduction of costs and to the production of more timely results. By reducing the editing and processing work load, sampling should make a major contribution to the timely release, of census results. Sampling will contribute to error, particularly for tabulation "cells" with very small numbers of observations, but the reduction in error through self-enumeration is expected to be greater. The objective is to minimize total error, at acceptable cost. Small numbers – five, ten or even fifteen – contained in census tabulations have significant error associated with them. The error contributed by sampling will not make results any less acceptable than the results from 100 per cent coverage. Even where the data are found by the user to be inadequate, they will frequently be sufficient to indicate problem areas and the need for more intensive survey information.

By its nature, the census is a multi-purpose information medium and, as such, cannot provide a sufficient depth of data for many particular purposes. This is one of the important reasons that

DBS is planning to expand its survey capability to meet special information requirements that cannot be satisfied by census statistics.

Data Access and Dissemination of Results

Plans have been made to improve the effectiveness of the storage and retrieval of census data substantially over 1961 and 1966. The computer technology which is available for the 1971 Census has far greater capability than that of earlier censuses, and the computer experience of 1961 and 1966 is being incorporated into the systems design, and the software and hardware plans for 1971.

Two new developments in computer technology, together with the design of the questionnaire itself, should speed the processing of census data.

Most questions are answered by filling in small circles, transforming them into black dots. When the questionnaires are returned to Census Headquarters, they will be photographed on microfilm.

An ingenious machine will feed questionnaires, one at a time, onto a photographic table, turning the pages automatically until each has been photographed by a high-speed camera poised directly overhead. The machine will feed and photograph an average of 120 questionnaire pages per minute.

Twelve such cameras will transform the 6,000,000 questionnaires into about 16,000 rolls of microfilm, each roll containing up to 3,600 questionnaire pages.

When the film has been developed, it will be a photographic negative. The black dots made by filling the circles will become transparent dots on a generally black background. In effect, they will be tiny windows in an otherwise opaque film.

The negative microfilm will then be fed through another machine, known as FOSDIC (Film Optical Sensing Device for Input to Computers). At a rate of about 450 pages a minute, the film passes through FOSDIC, to be scanned by a beam of light. The beam passes through the film wherever it finds a transparent dot and records the information on computer tape.

From the computer tapes, the data are transferred to the computer's memory core. This memory may be likened to a series of pigeon-holes, each receiving one kind of fact and at the same time keeping a running total of the items. In this way the computer builds up cells of facts about such items as age groups, places of residence, vocational training, income, education and so on.

Under instruction by a programmer, the computer can reach into several pigeon-holes at the same time – for example, those concerning groups between 10 and 20 years of age, within any city or any section of a city, by sex and mother tongue. It can thus relate total numbers by geographic location, by years of schooling, training skills, language and many other characteristics, in an almost infinite number of combinations.

The information can be retrieved in the form of printouts or computer tapes containing the various tabulations outlined by Census Division experts. Census data can also be retrieved by province, electoral district, county, metropolitan area, city or section of a city.

The only data that cannot be fed into the computer, and therefore can never come out of it, are the names or any other information that could identify individual respondents.

Moreover, if the tabulation of a very small area is likely to identify any single person or family, that tabulation will not be published, but will be grouped with others in adjacent sections of the city or town to maintain the confidentiality of the information.

The new methods and procedures will extend the range and volume of tabulations available for users. Close attention has been given to the development of working arrangements with provincial governments and other major groups to ensure efficient access to census data through more extensive and comprehensive use of users-oriented, automated files.

The extended capabilities of computer technology are also being used for the benefit of the continuingly increasing number of census data users by providing a wide and diversified range of special tabulations by means of computer storage and retrieval programmes. These include the DBS Geographically Referenced Data Storage and Retrieval System (GRDSR or Geocoding) and CASPER. The geocoding system, under development, is expected to provide rapid and economical access for users requiring special tabulations for non-standard types of areas.

An important development to users of agricultural data is the linkage of the population and agriculture questionnaires for the first time to provide population data regarding farm people against the background of the characteristics of their farms. For example, information regarding age, education, source of income, etc., of the operators of small holdings will provide data useful to the planning and administration of rural poverty programmes.

Special literature, catalogues and manuals on census data access will be prepared in order to ease and increase the effective utilization of the vast potential of the 1971 Census data.

CENSUS DIVISION PAPERS ISSUED

Reprinted Publications

Analytical and Technical Memoranda

Technical Papers and Technical Memoranda (1965-1968)

Lists of papers issued in above series may be obtained from:

Technical Co-ordinator (Research)
Census Division
Statistics Canada
Ottawa, Ontario
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